



Northern Rhodesia

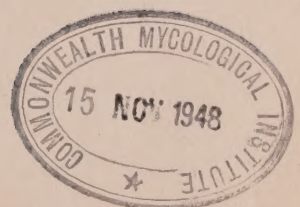
Department of Agriculture

ANNUAL REPORT
for the Year
1947

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STAFF LIST AS AT 31st DECEMBER, 1947

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J. D. Yelf, Agricultural Officer, Petauke.
E. C. F. Hyam, Agricultural Supervisor, Msekera.
J. W. H. Rowlands, Agricultural Supervisor, Kalichero.
W. J. D. Watson, Agricultural Supervisor, Katete.
Mrs. J. W. E. Ross, Part-time Clerk, Fort Jameson.

NORTHERN PROVINCE.

C. E. Johnson, Agricultural Officer, Lunzuwa.
E. G. Dabinett, Agricultural Supervisor, Lunzuwa.

Department of Agriculture

ANNUAL REPORT FOR THE YEAR 1947

AGRICULTURE IN THE TERRITORY.

1. The year 1947 was a bad one for the farming industry. The southern part of the Territory, which includes the main farming belt, suffered one of the worst droughts on record and there was a grave decline in the production of maize and wheat. Tobacco farmers were less affected and in spite of a difficult season there was some increase in the production of Virginia leaf.

Maize : Railway Belt.

2. The production of maize on European farms fell to about 270,000 bags, of which 190,000 were delivered to the Maize Control Board. The decline in the native crop, which is mostly produced by small growers who retain a considerable portion of the crop for their own consumption, was naturally more pronounced and only 54,000 bags came on the market in the railway belt.

3. The fall in production is apparent from the following table, which shows maize production in the railway belt (exclusive of inter-village trade in the native areas) during the past six years. The figures refer to calendar years and do not tally exactly with those for maize handled by the Maize Control Board in "pool years".

MAIZE PRODUCTION FOR SALE.

(Thousands of bags.)

<i>Year of Harvest.</i>	<i>European.</i>	<i>Native.</i>	<i>Total.</i>
1942	146	51	197
1943	144	60	204
1944	212	115	327
1945	273	202	475
1946	268	172	440
1947	190	54	244

In addition to the 244,000 bags acquired from the railway belt, 20,000 bags came in from distant areas.

4. Total amount of maize marketed for consumption during the year amounted to 455,000 bags and a further 80,000 bags (approximately) were retained for consumption on farms. Imports were slow in coming forward to meet the shortfall in requirements and a 25 per cent. ration cut was imposed in the early part of the year. Substitutes such as cassava meal and kaffir-corn, both locally grown and imported from the Congo, were used to reduce the consumption of maize.

Wheat.

5. Wheat production fell to less than 5,000 bags, mainly owing to lack of irrigation water following the drought and also to damage by exceptionally keen frosts during the growing season. Production over the past six years is shown by the following table :

WHEAT PRODUCTION FOR SALE.

1942	...	...	...	...	13,500 bags.
1943	...	...	...	...	21,000 bags.
1944	...	...	...	...	23,000 bags.
1945	...	...	...	...	25,500 bags.
1946	...	...	...	...	24,750 bags.
1947	...	...	...	...	5,000 bags.

Beans and Ground-nuts.

6. The Civil Supplies Department handled some 12,000 bags of beans and 5,800 bags of ground-nuts, locally grown. These crops, which are for the most part grown outside the main farming belt, show small increases over the previous season.

Tobacco : Eastern Area.

7. The flue-cured Virginia crop amounted to 2,928,662 lb., representing an average yield of about 400 lb. per acre. It sold at an overall price of 26.3 pence per lb. The South African quota reached the high average price of 60.9 pence per lb., and non-quota leaf (the bulk of the crop) averaged 21.3 pence. In this area the rainfall was the highest for some years, and whilst there was an expansion in acreage, both yield per acre and quality were down.

8. Production of other types of tobacco included 26,500 lb. of Turkish leaf, most of which was sent to the railway line for manipulation and export; 82,000 lb. of Western sun-cured and air-cured leaf, the bulk of which was exported direct; and 125,000 lb. of Burley, most of which was sold over the auction floor at an average price of 15.9 pence per lb.

Tobacco : Western Area.

9. The production of flue-cured Virginia tobacco increased to over 500,000 lb., the greater part of which was marketed by the North-Western Rhodesia Tobacco Co-operative Society at an average price of 24.5 pence per lb. Dry conditions made the season difficult, but quality was reasonably good and the earlier consignments sold fairly well on the Salisbury auction floors. Later consignments were shipped overseas.

10. Turkish tobacco production amounted to about 1,000,000 lb., most of which was delivered to the new warehouse at Livingstone for manipulation and export. The rapid expansion of the past few years was thus temporarily halted by the unfavourable season, and a tendency to turn from Turkish to Virginia leaf was noticed in some parts of the area.

The Red Locust.

11. Renewed breeding of the red locust gave rise to anxiety during the year. In June, International Conferences, attended by representatives of all the territories concerned in the fight against the red locust and by Dr. B. P. Uvarov, Director of the Anti-Locust Research Centre in London, were held at Abercorn and Lusaka. These resulted in the setting up of the International Red Locust Campaign Directorate in Lusaka to organise any campaigns that might be necessary for the destruction of locusts outside the known outbreak areas and to co-ordinate the work of the International Red Locust Control Service in the outbreak areas, pending the appointment of a permanent central council. By the end of the year preparations had been completed for large-scale campaigns in the outbreak areas and over a large part of Eastern Africa where breeding by escaped swarms might be expected. These campaigns are financed by the Belgian Congo, the British East and Central African territories, Southern Rhodesia and the Union of South Africa.

12. During the year an experimental campaign using aircraft to spray flying swarms of locusts was carried out in the Rukwa outbreak area with aircraft of the South African Air Force and two specially designed and equipped machines supplied by the United Kingdom Government, under the direction of Dr. Gunn of the Anti-Locust Research Centre. Results at first were somewhat disappointing, but in the later stages of the campaign good results were obtained in air-to-ground spraying with the insecticide DNOC. It is hoped to follow up this success by developing a technique for "curtain spraying" to destroy locust swarms in flight.

Agricultural Show.

13. The revival of the Agricultural Show, which has been in abeyance during the war years, was a welcome feature of the year. It was held at Lusaka in July, and whilst agricultural exhibits naturally reflected the very adverse season the Society is to be congratulated on reviving an invaluable institution and on the degree of success achieved.

THE WORK OF THE DEPARTMENT.

14. The establishment was increased during the year by the appointment of seven Agricultural Supervisors. Against this have to be recorded losses of two Agricultural Officers (one resigned, one transferred to another Colony) and two Agricultural Supervisors (one resigned, one transferred to another department). The Director went on leave pending retirement towards the end of the year. At the end of the year the establishment of European officers was :

<i>Approved.</i>	<i>Actual.</i>	<i>On Duty.</i>
1	1	— Director (on leave).
1	1	1 Assistant Director (acting Director).
1	1	1 Ecologist.
3	3	3 Senior Agricultural Officers.
10	7	6 Agricultural Officers.
3	3	3 Senior Agricultural Supervisors.
10	9	7 Agricultural Supervisors.
4	4	4 Clerks (including 1 learner, 2 part-time).

Vegetation-Soil Map.

15. The vegetation-soil map was published during the year with an explanatory memoir by the Ecologist. The map shows on a scale of 1 : 1,000,000 the vegetation types of the Territory with supplementary indications of the types of soil occupied by each vegetation type. The vegetation types are represented as fully as practicable for a map of this scale, but indications of soils are confined to major soil groups such as would find a place in a general African classification. In their general outline the soil groups are believed to be pedalogically sound ; but as their classification has for the greater part been worked out from field traverses and profile observations without soil analyses, no Soil Chemist having been available, amplification and modification of their limits will no doubt be necessary at some future date. The map and the explanatory memoir embody the results of many years of exacting work by the Ecologist and other members of the department and will be of the greatest value to all concerned in planning agricultural development.

The Ground-nut Project.

16. A good deal of work was done during the year in connection with the ground-nut project, which in its original form visualised the early establishment in this Territory of seventeen units, each 30,000 acres in extent. Difficulties of transport and communications met with in Tanganyika made it appear necessary to push ahead in localities close to existing railways, and the Ecologist has been occupied since his return from leave, in collaboration with an Agricultural Officer, on exploratory work with a view to finding suitable areas close to the railway line in this Territory for the early establishment of at least five units. After investigation of possible localities it was finally decided to concentrate attention on two, those in the vicinity of Mumbwa and Mulobezi. After aerial photographs had been obtained maps were drawn up, ground checks were carried out, and an interim report on the Mumbwa area was made.

17. At the same time ten widely scattered experimental plots were established, two on each of five main soil types ranging from the Transitional Kalahari Sands in the south-west of the Territory to the Lake Basin soils of the north-east, with a corresponding range of rainfall. At each site the trial covers three varieties of ground-nut and various fertilizer treatments. As an attempt to try out the crop simultaneously with variety and fertilizer trials on a full range of soil types, it is probably one of the first of its kind to be made with ground-nuts.

European Farming.

18. One Senior Agricultural Officer is engaged on full-time advisory services to European farmers in the main farming belt, and the part-time services of other members of the staff stationed on the railway line and in the Eastern Province are available. The Senior Agricultural Officer, Lusaka, made 402 visits to 172 different farms from Magoye to Broken Hill during the year. His services included advice to new settlers on the selection of land, farm layout and cropping programmes ; and the layout of soil conservation works and of improved irrigation schemes. Advisory work on tobacco has been eased, but not satisfied, by the appointment of an additional specialist adviser to the Western tobacco growers.

19. It is estimated that a further 3,000 acres of arable land were protected from erosion during the year, bringing the total extent of dry-land so protected to about 15,000 acres. Some hundreds of acres of irrigable land have been brought under well-designed small irrigation schemes on a number of different farms during the past few years.

Experiments in European Agriculture.

(a) LUSAKA WHEAT STATION.

20. Wheat experiments were continued under the greatest difficulties. Shortage of water following the severe drought reduced the acreage that could be irrigated and a disastrous frost in mid-July caused much damage. In the circumstances experiments gave

meagre results, and little can be added to the conclusions, based on three years' work, recorded last year. No Plant Breeder is yet available and the programme is restricted to the observation under local conditions of imported pure lines of wheat.

21. The bulk plots were planted very early in an attempt to beat the water shortage, and while this led to some damage from rust it enabled the early-maturing varieties to escape the worst of the frost. *Australian 26A. 14* (Southern Rhodesia) gave the best yield; *Pusa 4* and *Punjab 8A* also did well though affected by rust; *261. R7. C1. B*, though a promising wheat, suffered heavily from bird damage. In the small experimental plots, which were planted a month later, *Punjab 8A* was outstanding though slightly affected by rust and is still considered to be the best wheat for areas not subject to severe rust. The two *Sabaneros* continued to show promise, but the early-maturing varieties were all destroyed by frost and only seven of the twelve varieties planted were harvested. A number of small samples of newly imported varieties, which were not planted till the end of May, largely escaped both rust and frost and gave the greatest increase on the seed sown, but they had to be nursed through a bad attack of aphid with dressings of gammexane.

22. Preparations for work on dairy farming were started, but lack of water made it impossible to begin an intended scheme of irrigated grazing. Development of the dry lands continued.

(b) MSEKERA TOBACCO STATION.

23. The Msekera tobacco station near Fort Jameson experienced its wettest season for some years and both yield and quality of the tobacco suffered. Seven and a quarter tons of flue-cured tobacco were sold over the auction floor at an average price of 33.4 pence per lb. The average yield was down to 614 lb. per acre, but this was well in advance of the district average for the season, estimated at about 400 lb. per acre. The leaf was thin and lacking in body as would be expected in such a wet season (no less than twenty inches of rainfall was recorded in the month of March). About 60 lb. of carefully selected, cleaned and treated seed was produced and sold to planters in the district, and 132 lb. of seed grown by planters for their own use was cleaned and treated on the station.

24. The four-course rotation of tobacco: tobacco: sunnhemp: maize continues to give satisfactory results on the fertile red loam of the station. Trials of new rotations which incorporate grass leys have been started and experiments on the spacing of tobacco plants in the field, eelworm control, and regeneration of woodland after cutting for fuel are in progress. Bonanza and Jamaica Wrapper gave the best yields in the variety trials this year.

Native Agriculture.

25. Departmental work on native agriculture was based on the following stations:

SOUTHERN PROVINCE	...	...	Kanchomba. Monze. Magoye.
EASTERN PROVINCE	...	...	Katete. Kalichero. Petauke.
WESTERN PROVINCE	...	...	Kambowa.
NORTHERN PROVINCE	...	...	Lunzuwa.

Work in Serenje District of the Central Province was based on Kambowa. Responsibility for work in Fort Rosebery and Kawambwa Districts was transferred in the middle of the year from Lunzuwa to Kambowa, following the transfer of these two districts from the Northern to the Western Province.

Reclamation and Preservation of Native Areas.

(a) SOUTHERN PROVINCE.

26. Work in the Southern Province has been confined to the Tonga Chieftaincies in Mazabuka District, which form the core of the native maize-growing area and constitute what is at present, economically, the most valuable land in native occupation in the Territory. During the past seven years much has been done to check the worst ravages of soil erosion in the cultivated lands, many thousands of acres of which had suffered serious damage.

27. The first task undertaken was the construction of graded contour ridges on all cultivated land subject to serious erosion by the passage of storm water over the unprotected soil. One thousand two hundred miles of contour ridge had been constructed on over 50,000 acres of cultivated land up to the end of 1946, and the retirement from cultivation of much land liable to such rapid and grave deterioration under the plough as to be best restored to pasture or woodland was secured. Latterly, with much of the land most urgently in need of protection dealt with, it has become possible and indeed necessary to devote more attention to the improvement of agricultural practice on the protected lands so as to ensure the preservation of the works constructed.

28. During the year only a minimum of contour ridging was carried out. The simpler and much cheaper method of demarcating contour grass strips was applied to land on which it was considered that this protection would be adequate. Altogether about 338 miles of contour grass strips, five yards wide and marked by stout posts, were established on some 5,000 acres of land during the year at a cost of just over 30s. per mile. The following table shows the acreage of cultivated land protected and the mileage of contour ridge constructed and of grass strips demarcated in this area up to the end of the year :

		<i>Acres protected.</i>	<i>Miles of contour ridge.</i>	<i>Miles of grass strip.</i>
1940-46	...	57,179	1,203	343
1947	...	5,000 (<i>approx.</i>)	8	338
		62,000 (<i>approx.</i>)	1,211	681

29. Certain simple improvements in agricultural methods have been demonstrated over a period of years by selected African cultivators on their own holdings, scattered throughout the area, working their land on principles laid down by the agricultural staff. The system of cultivation is a simple one, involving an elementary four-course rotation in which one quarter of the holding is cropped with legumes and another quarter dressed with kraal manure or compost. Contour ploughing, preservation of anti-erosion works and reasonably clean farming are of course part of the system. Few among the population have in the past made any serious attempt to reach even this elementary standard, although its advantages have been amply demonstrated both by the paid demonstrators and in approved school gardens.

30. A further step, long considered, was taken during the year to promote better husbandry. A scheme of Improved African Farmers has been started, by which any African farmer in this area desirous of putting into practice the improvements which have for so long been urged upon him may register as an improved farmer at the local agricultural station. The holdings of such registered farmers are inspected during the growing season and a certificate is issued to those who reach the required standard. This certificate is produced by the grower when he markets his crop and entitles him to a bonus of 4s. per bag of maize sold. Only a small number succeeded in qualifying for the bonus in this, the first, year of the scheme, but many emulated the demonstrators in part, and a large number have registered for the coming season.

31. This measure is expected to lead to an improvement in farming practice on the part of the more substantial cultivators, but many of the smaller subsistence cultivators lack the resources to carry out even these simple improvements, and a further limiting factor to the universal adoption of the system is the stock-carrying capacity of the natural grazing. The system depends on sufficient cattle being kept to maintain the fertility of the cultivated land by manuring. Whilst the carrying capacity of the natural grazing is not precisely known it has been calculated from such information as is available that the maximum population that could be permanently supported in the Tonga maize-growing areas under the system of agriculture recommended, assuming that an adequate food supply and an annual cash income of not less than £10 per household are to be derived from the land, is probably between forty and sixty per square mile. Accurate population figures for this region do not exist, but there is every indication that the population is approaching, if indeed it has not already reached or exceeded, this limit over much of the area. The need for yet higher standards of farming than those at which we have been aiming is apparent.

32. The output from arable land could be increased by the use of fertilizers and green manure. Arrangements are being made to encourage improved African farmers in this area to buy fertilizers, and the possibility of growing sunnhemp for green manuring or composting on African holdings is being investigated. To encourage such practices high yields of maize per acre are to be rewarded in the coming season by an additional bonus of 5s. per bag sold in excess of a delivery yield of six bags per acre.

33. An experimental settlement was begun during the year on a small block of Trust Land close to the Magoye station which approaches the problem from the standpoint of improving the stock-carrying capacity of the grazing. This block of land, just over 2,000 acres in extent, adjoins the most densely populated and heavily stocked part of the Tonga plateau. The cultivable land of the block has been divided into four arable fields, three hay paddocks and a village site. The rest of the block is to be used for grazing. The four arable fields will be worked in common by the settlers on the standard four-course rotation recommended to African farmers. The hay paddocks (worked on a rotation of two years' mowing and one year's rest for seeding) will be used to increase the stock-carrying capacity by conserving winter feed. Implements and fencing are being supplied, and water supplies improved. The scheme reproduces some features of the ancient open field system of England, adapted to the different conditions. The experiment will, it is hoped, yield information on the practicability both of maintaining heavy populations on the land, and of improving the farming standards, of the small subsistence cultivators by co-operative methods. The capital cost, however, may prove to be heavy in relation to the means of the people concerned.

34. In addition to the work on arable land carried out during the year the construction and maintenance of roads and small dams to assist in the control of erosion again formed part of the programme in this area. Over forty miles of new road were made; fifteen small earth dams and five rather larger dams were built.

35. The Senior Agricultural Officer visited the Toka-Leya Reserves in this province and Sesheke District in the Barotse Province to advise on problems of food shortage and submitted reports.

(b) EASTERN PROVINCE.

36. The large-scale movements of population in Fort Jameson and Petauke Districts from congested areas within the reserves into controlled resettlement areas, which have been proceeding since 1942, have been checked until water supplies can be produced in the remaining areas available for resettlement. No fresh resettlement took place during the year.

37. A good deal of soil conservation work was done in the reserves and controlled areas. Two systems are in use. In the resettlement areas contour bush strips ten yards wide (known to the people as "ten-yardis") are demarcated before cultivation begins and are left uncultivated. In the reserves contour ridges demarcated by agricultural staff are dug mainly by the garden owners. In some areas the two systems are combined, intermediate contour ridges being placed between the "ten-yardis". Under the system of hoe cultivation practised here the crops are planted on small mounds, and efforts are being made to replace these mounds by ridges dug along the contour, thus reinforcing the protection given by contour ridges or contour bush strips.

38. During the year a total of 310 miles of contour ridges were constructed, mainly in the reserves, at an average cost of just over £3 per mile. A further 458 miles of intermediate contour ridges were constructed in resettlement areas to reinforce the ten-yard contour bush strips established when resettlement took place and these cost 35s. per mile. Five miles of graded contour ridge, the most costly form of protection, were constructed in the Angoni reserve, in an area where ploughs are used, at a cost of £6 per mile. Other work done during the year included building a small earth dam for the native authority, and construction of banks to guide surplus water collected by contour ridges into natural watercourses.

39. Contour working of the lands is of course a necessary accompaniment of soil conservation works. The native is much attached to his traditional mounds and is not easily convinced that they could be replaced with advantage by ridges dug along the contour. Although progress has been made in bringing about this conversion much opposition to it is expressed by chiefs and people, and experiments on the practicability of controlling erosion by contour ridges while retaining the mound system of cultivation have been started. In cattle areas the plough is beginning to be used in place of the hoe, and to guard against the consequences that have followed its general adoption in some other parts of the Territory a measure of control has been instituted. A permit is necessary to acquire a plough and applicants are required to accept conditions regarding the proper maintenance of the implement and the adoption of contour ploughing.

(c) WESTERN PROVINCE.

40. Movement of villages from the congested areas about the southern and eastern margins of the Copperbelt into unoccupied Trust Land began in 1943, and by the end of 1946 there had been transferred 130 villages. The principle which governs transfers of population from congested districts is that the numbers moved into resettlement areas shall not exceed

the estimated carrying capacity of the land under the traditional system of agriculture, so that problems of land deterioration caused by congestion of population will be confined for the time being to the existing congested districts and will not immediately extend into the resettlement areas.

41. In the case of the Copperbelt movements it was found that the numbers actually moved into the new areas were less than had been anticipated, and further transfers of people could therefore take place without risk of congestion in the resettlement areas. A further forty-two villages were transferred during the year, bringing the total number of villages moved to 172. Population counts suggest that organised large-scale movements are unpopular, and that as few people as possible participate, but that a steady infiltration follows, as the advantages of resettlement come to be seen by the people.

42. A movement of a different kind took place in Kasempa District, where about 1,500 people moved about thirty miles out of a sleeping sickness area largely under the direction of Chief Kasempa. A senior agricultural supervisor toured the new area with the chief, and an agricultural capitao remained to advise on the preparation and planting of the new gardens.

43. Cultivated land in the Copperbelt resettlement areas was at the outset demarcated with contour bush strips, five yards wide. These were unpopular and many people availed themselves of an alternative form of protection and converted the bush strips into two or three small ridges which were planted with legumes. This variant of "strip-cropping" ensured at least some planting of pulses, which tend to be neglected to the detriment of diet in this area. Stress is now being laid on the building up of the upper ridge with a view to converting the two or three small ridges into one well-made broad-based ridge.

44. Efforts continue to be made to increase the acreage and variety of food crops. The seed farms produced excellent crops and provided a good demonstration of the results of improved methods. Selected seed of the common native crops was distributed on a fairly large scale and new varieties of sweet potatoes and cassava are being bulked. Six fruit tree nurseries have been established for raising seedling lemons, guavas and mangoes and for bulking banana suckers for distribution. Four small dams were built, two of them to provide irrigation water for vegetables.

45. A vegetation-soil survey of an area between the Kafue and Kafulafuta rivers, which is intended to take a number of Nkana villages now on Crown land or in mining concessions, was completed. Visits were paid to various parts of the province to make preliminary recommendations regarding development in the three development areas of the province, and also to the Barotse Province to advise, with other technical officers, on a Development Centre.

(d) NORTHERN PROVINCE.

46. In the Northern Province a system of control of *chitemene* is maintained over an area of some 3,000 square miles with a population of about 22,000, which embraces some of the principal headwaters of the Chambesi river. Because of the high land requirements of the *chitemene* system, which relies on the annual lopping of tree branches over an area much larger than that cultivated in order to provide fuel for the fire which both fertilizes and prepares the soil for planting, congestion had arisen in some of the Abercorn and Isoka reserves with quite low population densities. Since food production under this system depends on the supply of fuel the consequent deforestation brought food shortage in its train.

47. Part of the population concerned was resettled under control in vacant Trust Lands, and the system of control extended to one of the four most seriously affected reserves, with the approval of the native authorities, in the years 1939 to 1943. Every year blocks of land in which cutting of gardens is permitted are demarcated and a few simple rules to eliminate waste and promote regeneration of trees are enforced. In this way wholesale deforestation is prevented. No further large-scale resettlement took place during the year but a few new villages came into the scheme. Very little vacant Trust Land remains.

48. Actual erosion of soil becomes of consequence only on the hoe-cultivated subsidiary gardens which adjoin the village, but these gain in importance as the supply of fuel for the burnt gardens declines with increase in population. Contour ridges are aligned in these gardens and dug by the garden owners. Every year any fresh land brought under cultivation is protected in this way. Propaganda for ridge-cultivation to replace mounds is being intensified now that contour ridges, which show the direction of the contour, have been demarcated. Many of the contour ridges have been planted with pigeon peas: Napier fodder is being bulked to supply planting material to be distributed for planting on them. These activities are largely confined to the controlled areas, staff being as yet insufficient for work elsewhere.

49. The seven seed farms, which are mostly located at native authority headquarters, continue to provide a demonstration of improved methods of agriculture and to supply selected seed and planting material for distribution. Four of these are in the *chitemene* control area and two are just outside its borders, but during the year a start was made in opening three new seed farms, widely scattered through the province. Fairly large quantities of seed of various food crops, as well as small quantities of wheat, English potatoes, seedling fruit trees and banana suckers, were distributed.

50. A vegetation-soil survey of the Mambwe Reserve 4 was begun but had to be postponed indefinitely through shortage of staff. This small reserve, less than 200 square miles in extent, supports a population of more than 7,000 people and as many cattle, as a result of which the soil, which is above average quality for the district, is deteriorating. A map is being constructed to show both the distribution of the main vegetation-soil types and the degree of erosion in the cultivated lands.

51. A brief visit was made to the Bangweulu swamps to investigate any immediately practicable possibilities of improving food supplies there. The people are much occupied with fishing and their lands are somewhat waterlogged. Attempts are being made to interest them in quick-maturing yellow maize, a crop of which might be snatched in certain sites during the low water period just before beginning of the rains, and seed for this purpose was supplied to the District Commissioner for distribution.

52. In the neighbourhood of Shiwa Ngandu a few peasant farmers are being settled on forty-acre holdings, oxen and implements having been supplied to the tenants on loan by Sir Stewart Gore-Browne. The holdings are scattered and held in individual tenure and the aim will be to bring them to a standard somewhat similar to that of the improved African farmers of the Southern Province. First indications are that most of the tenants have made a promising start.

(e) CENTRAL PROVINCE.

53. The plateau area of Serenje District provides an example of a traditional agricultural system in an advanced stage of decay. An extremely primitive and wasteful form of the *chitemene* system is resulting in widespread land deterioration in spite of a mean population density of only 7.3 persons per square mile. A survey of this area made in 1945-46 was reviewed in the Annual Report for 1946. It was judged that the food position is not yet critical but that the population as a whole has a barely adequate supply of the staple foods, and the normal surplus which is the safeguard of subsistence agriculture has disappeared. The report suggested immediate measures to arrest the otherwise inevitable approach of famine and a scheme for long-range agricultural development was proposed.

54. Early in 1947 a nutrition survey was started by the Health Department and later in the year preliminary agricultural work began under a Senior Agricultural Supervisor. The local system of agriculture is being studied with a view to finding a practicable means of controlling the wholesale felling of trees, and cattle have been acquired for an experiment in co-operative peasant farming. A member of the Nutrition Team is assisting in the study of the local agricultural system by collecting information on the size of gardens and their output.

Introduction and Improvement of Native Food Crops.

55. The selection of kaffir-corn continued at Kambowa station and to the local strains have been added dwarf varieties from the United States of America. Twenty-four varieties are under trial, consisting mostly of white-grained types of *Sorghum conspicuum* var. *pilosum*, *S. coriaceum* var. *involutum* and *S. caffrorum*. Some of the more promising are being grown in larger plots to provide seed for distribution to the seed farms next year. A number of local strains are also under trial at Lunzuwa in the Northern Province. Seven varieties of rice are under trial at Kambowa, the best yields being obtained from the local red strains from Pemba and Balovale.

56. Selection of mosaic-resistant cassava varieties which tolerate high altitude conditions continues at Lunzuwa, where the four varieties now being bulked excited the interest of the Director of Agriculture for the Katanga Province of the Belgian Congo when he visited the station, and a few cuttings of each have been sent to him for trial. A further four promising varieties, selected from a large number, are under preliminary trial. The demand for vines of the calabash sweet potato and for seed of the butter bean continues to exceed the supply. Hickory King and Sahara maize were distributed in some quantity, but edible varieties of soya beans, although they grow fairly well, are not in demand.

57. The Natal Common and Virginia Bunch varieties of ground-nut are being bulked for distribution in the Eastern Province. Trial of local and introduced varieties of cowpea, the main pulse crop of the Southern Province, continued at the Magoye station. The South African variety, Dr. Saunders, has given the greatest yield over the past three years but is not proving popular as it sheds its seed very soon after ripening.

Native Agricultural Education.

58. In the Southern Province a fresh step was taken during the year to encourage well-run school gardens. These gardens, in which the system of husbandry recommended for general adoption in the Tonga maize-growing areas is practised, have proved to be of considerable value and have, perhaps, influenced agricultural practice in this area more than any other method of approach. In the past implements and oxen have been provided by parents and manure has been readily obtainable; but now that the parents themselves are adopting the improvements demonstrated they can no longer spare these requisites at the right time, and a decline in the efficiency and adequacy of the school gardens resulted. Selected schools are now being supplied with stock and implements to enable them to run a garden of adequate size on the lines laid down for improved African farmers. Fourteen schools were thus supplied during the year. This policy implies concentration on a few selected gardens and should result in a high standard being achieved in them.

59. In the Northern Province school gardens are hoe-cultivated and their aim is to demonstrate a few simple improvements on a sufficiently large scale to attract the attention of the people and to produce tangible results in the shape of more food for the pupils. Twenty-five schools are each staffed with an agricultural teacher trained at the Senga Agricultural Teachers' Training School. These men are qualified teachers whose training has a very strong agricultural bias, and their special job is to supervise agricultural activities at the schools to which they are posted. Priority in posting them is given to the lower and upper middle schools, though excellent gardens have been started at elementary schools in spite of the small size and tender years of the pupils. A valuable feature of the scheme is the annual advisory visit paid to them by the Principal of the Senga school. The output of Senga teachers this year was disappointingly low due to bad examination results, but school gardens are by no means confined to schools staffed with these specially trained teachers. Large and well-run gardens exist at the two main teacher-training institutions in the province so that all teachers-in-training now get some degree of agricultural experience.

60. Agricultural education in the Western Province is very backward, an exception being provided by Kawambwa District, where the teacher-training school at Mbereshi has a large and well-run school garden and several schools are staffed with agricultural teachers trained at Senga. Mutanda Mission, near Solwezi, has been selected as a centre at which agricultural education might be developed.

61. Little has yet been done on school gardens in the Eastern Province with the exception of the native authority schools at the Chewa and Angoni centres and three schools in the Katete resettlement area. A native authority demonstration farm, equipped with cattle and ox-drawn implements, has been opened at the Angoni centre. Visits were organised to the railway-line agricultural stations and farming areas of a party of indunas from the Barotse Province and of Chief Mwase Lundazi from the Eastern Province.

Experimental Work on Native Agriculture.

62. Experimental work on native agriculture is carried out to some extent on all agricultural stations, although most of the present experiments are centred at the Katete and Petauke stations in the Eastern Province, where the working and cropping of local soils under the conditions imposed by native agriculture are being investigated. At Lunzuwa in the Northern Province the problem is to find suitable crops and methods of cultivation to supplement and eventually to replace the *chitemene* system which can only be practised where population is very sparse. The agricultural station at Kambowa has recently been vacated by the Polish evacuees and is now being opened up for experiments. In the Southern Province attention is mainly focused on the urgent problems of controlling erosion and securing the general adoption of a system of farming evolved out of past experiments at Kanchomba.

63. The experiments at Katete and Petauke are long-term in character and only a few preliminary indications have emerged as yet. The native practice in this region is to grow maize on small mounds from which earth is shifted during the growing season and heaped

over weeds to form fresh mounds between the old ones. The new mounds are used for inter-cropped pulses and are planted with maize in the following season, when the procedure is repeated. There is thus a rotation of crops between the old mounds and the new, and weeds are utilised as manure. The disadvantage of mounds is that they are vulnerable to erosion, and their replacement by ridges aligned on the contour has been widely advocated to overcome this.

64. The experimental programme aims at testing the value of ridge as compared with mound cultivation over a period of years; finding the best spacing for ridges and the best procedure for splitting them so as to form the new ridges between the old; comparing inter-cropping with orthodox crop rotation; investigating the possibilities of increasing yields by bringing on the land additional organic matter such as green grass and kraal manure; and trial of various cultivation practices and anti-erosion devices for long-term effects on soil fertility.

65. So far there is a definite indication that planting on mounds or ridges gives better yields of maize than planting on flat ground, but no difference has been observed between mounds and ridges. An experiment on sloping ground, in which ridges along the contour protected by contour banks at three-foot vertical intervals are compared with mounds without such protection, has given an indication in the third year of cultivation that yields of maize from the unprotected mounds have fallen below those of the protected ridges; but another experiment which includes mounds protected by contour banks as well as the above two treatments has given as yet no indication one way or the other.

66. Experiments on different times and methods of splitting ridges (to form the new ridges in between the old for the following season's planting of maize) have given no indications except that yield seems to be depressed if the new ridges are made in the dry season after harvest rather than during the growing season. Spacing trials suggest that the best yields of maize under local conditions are obtained with theoretical plant populations of between 5,000 and 8,000 per acre, whether the plants are spaced singly at 4 ft. by 2 ft. or in threes at 4 ft. by 4 ft. No conclusions can yet be drawn from the crop rotation *versus* inter-cropping trials or from the long-term soil fertility experiments.

67. At Lunzuwa, rotation experiments have shown that finger millet, the staple crop of that region, which in native practice is grown by the *chitemene* method on ground prepared by a heavy burn, yields very poorly on hoe-cultivated land under continuous rotational cropping, but when grown on land that has been under grass for some years yields of this crop are higher and less variable, falling to a low level after the land has been in cultivation for two or three years even with composting and crop rotation. Kraal compost has been found to increase yields of cereals, but its effect is variable and, especially with finger millet, the increases are often insufficient to repay the cost of manuring on these soils. Green grass compost made without cattle droppings has not proved very effective.

Native Export Crops.

(a) COTTON.

68. There were only sixty-three growers of cotton in the Marambo area of the Luangwa valley, and the total production was about 2,000 lb. of lint, which was sold at 1s. per lb.

(b) BURLEY TOBACCO.

69. The number of growers in the Burley tobacco scheme in Petauke District increased to 989 and the acreage of tobacco planted to 366 acres. A total of 72,033 lb. of tobacco was sold over the auction floor at Fort Jameson for £5,262, an average of 17.5 pence per lb.

70. In previous years the growing and marketing of the crop has been supervised entirely by the Agricultural Department, which employed staff to grow and distribute seedling plants; to advise growers on the cultivation, picking and curing of the crop; to buy the cured leaf from the growers; and to grade, handle, pack and sell the final product. The Petauke Producers' Association, which includes a tobacco section for dealing with the Burley tobacco and a food producers' section for dealing with ground-nuts (an important crop in this area), now employs a European manager who will be able to take over much of the work hitherto done by an Agricultural Officer in connection with these crops. Control of the Association is now in the hands of the Registrar of Co-operative Societies. It starts in a good financial position with a flourishing young industry which last year sold over 70,000 lb. of Burley tobacco for export and some 4,500 bags of ground-nuts for consumption within the Territory.

Development Plans.

71. During the year the "Ten-year Development Plan for Northern Rhodesia" was published. The section devoted to agriculture is based on the development plan prepared in 1945 for agriculture and forestry by the Director of Agriculture, which has been amended only in minor details. This plan was divided into three sections: *A.*—Agricultural Services to Africans; *B.*—Services to European Farmers; *C.*—Administration and Research, and it contained an appendix which gave an outline of the main problems and possibilities in land conservation, agricultural improvement and agricultural industry in each of the ten development areas of the Territory. The Ten-year Plan for the Territory as approved by Legislative Council on the 11th February, 1947, describes this appendix as "a document of the greatest importance for all officers working on rural development and must be carefully studied in development centres and development districts". The broad framework within which agricultural development can best proceed thus appears to have been established, but progress is still held up by shortage of staff.

Conclusion.

72. During the year the department lost its Director of many years' standing in Mr. C. J. Lewin, M.C., who went on leave pending retirement in September. He served Northern Rhodesia for seventeen years, first as Chief Agriculturist and then for fourteen years as Director of Agriculture. Coming at a time when "economy" was the order of the day and when the value of an agricultural department was by no means generally appreciated in the Territory, he rebuilt a small but efficient department from the ruins created by wholesale retrenchment. To his staff he was always intensely loyal and his departure is a loss to them and to the Territory.

MAZABUKA,
19th May, 1948.

E. F. MARTIN,
Director of Agriculture.

